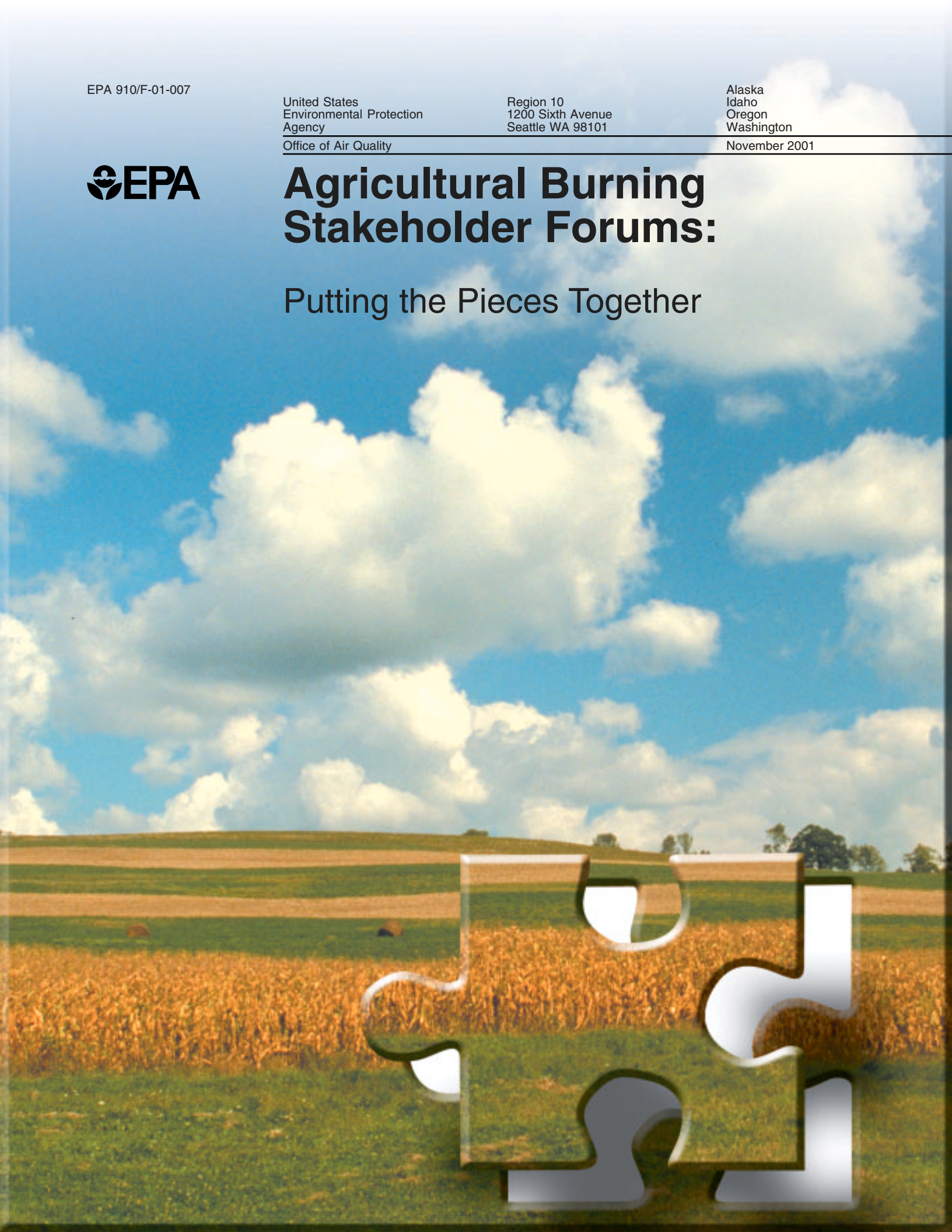




Agricultural Burning Stakeholder Forums:

Putting the Pieces Together



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Agricultural Burning Stakeholder Forums: Putting the Pieces Together

Introduction

The U.S. Environmental Protection Agency (EPA) Region 10 office sponsored four Agricultural Burning Stakeholder Forums throughout the Pacific Northwest from January to May 2001. The forums attracted about 300 participants in five-hour sessions in:

- ▶ Coeur d'Alene, Idaho on January 27;
- ▶ Pendleton, Oregon on February 24;
- ▶ Moscow, Idaho on March 10; and
- ▶ Pasco, Washington on May 12.

This report provides an overview of some of the technical information heard at the forums, a summary of stakeholder perspectives and concerns, and some new information on efforts being made toward solutions.

Purpose and Goals

The forums were held to create a setting conducive for interested and affected parties to learn more about the many pieces of the puzzle related to agricultural field burning. Experts in agriculture, health, and government were invited to share information and interact with stakeholders in order to meet the following goals:

- ▶ Increase knowledge of the different sides of the issue, including technical, human, environmental, and economic aspects;
- ▶ Improve understanding of the range of people's concerns and questions;
- ▶ Develop ideas for workable solutions; and
- ▶ Increase opportunities for ongoing participation and trust among stakeholders.

The forums were designed with extensive input from various partners and co-sponsors and tailored to reflect local concerns and conditions. Each forum was designed around three main themes: 1) the **Agricultural** perspective, 2) the **Public Health** perspective, and 3) a moderated panel discussion with **Government** agency representatives.

Summary of Key Messages

Agriculture: Growers and other agricultural experts explained that field burning was a tool used to manage crop residue, diseases, and pests, or to increase crop yields and the economic viability of farms. Depending on the crop, farming method and other factors, we heard that some growers burn only as a last resort, while others may use the practice every year. Support was expressed for more research and education on alternatives to burning, such as direct seed farming systems, and for more economic incentives to help reduce or eliminate burning.

Health: We heard that smoke from field burning can cause adverse health effects, especially to those with respiratory diseases like asthma. Concern was raised over why the practice was allowed to continue, considering the scientific evidence which correlates air pollution with increased illness and death, and the many complaints received by agencies. Support was expressed for more research into the health effects of smoke (especially short-term peak exposures), for more air quality monitoring sites, and for making more real-time air quality information available to the public.

Government: We heard from various agencies at the federal, state, tribal, and local level that there is a wide range of tools and approaches used for field burning in the Northwest. Some jurisdictions operate regulatory permit-based programs, while others have non-regulatory or voluntary programs. Legal authorities and resources to implement programs are diverse. Some agencies are more responsible for environmental and public health protection, while others assist the agricultural community. Stakeholders expressed many opinions over government roles and desired level of involvement. Some wanted the agencies to do more to control or eliminate field burning, while others wanted more local flexibility and less regulatory control.

Forum Partners

Representatives from the following agencies and organizations worked cooperatively with EPA to help plan, host, or conduct the forums.

Agency for Toxic Substances and Disease Registry
Benton County Clean Air Authority, Washington
Coeur d'Alene Tribe
Confederated Tribes of the Umatilla Indian Reservation
Idaho Department of Agriculture
Idaho Department of Environmental Quality
Nez Perce Tribe
North Idaho Farmer's Association
NW Research Center for Particulate Air Pollution & Health
Northwest Dynamics
Oregon Department of Environmental Quality
Oregon State University
Pacific Northwest Direct Seed Association
Pacific Northwest Fiber
Umatilla County Soil and Water Conservation District
Umatilla County, Oregon
University of Washington
Washington Department of Ecology
Washington State University
Whitman County Health Department

Putting the Pieces Together

After each forum, an information package was mailed to participants who provided their address. The package included copies of speaker presentations and the comments and questions from participants recorded on flip charts at each table. Detailed forum summaries are available online from EPA Region 10's website at: <http://www.epa.gov/r10earth/> (then click on the Air button, and then Agricultural Burning). See Appendix 1 for a summary of stakeholder views.

Putting the Pieces Together: Agriculture

We heard that field burning is a way for farmers to manage crop residue after harvesting and to combat crop diseases, insects, and weeds, and that it can sometimes help to increase crop yields. We also heard about some ways to manage residue with little or no burning, such as leaving the stubble on the land and then planting directly through it or working it into the soil, or through removing the straw by cutting, baling, and transporting it to offsite uses.

Growers are concerned that field burning will be taken out of their “toolbox” of agricultural practices and they will lose the benefits and flexibility of managing residue through fire. While some said they use the practice on a routine basis, many others burn only as a “last resort” when other options fail or aren’t available. The different approaches are due to a complex mix of factors, including the type of crop, how fire affects crop yields, the amount of residue left after harvest, the cost and availability of farm equipment to deal with residue, straw markets, habit, and lack of experience with alternatives to burning. In general, grass fields are often burned every year after harvest (August to September) to stimulate growth of the next year’s crop, while wheat fields are typically burned in the Spring to prepare the field for planting or in the Fall after harvest to remove excess residue.

Many growers said they support greater use of alternatives to burning, but noted that some were not economically feasible or practical for all crops and locations in the region. For example, direct seed farming is more applicable to cereal grains like wheat than for grass crops. Growers would like to see more research conducted on methods to reduce field burning, large-scale demonstration projects, and more economic incentives that would reduce the economic risk of using new practices. A number of efforts related to alternatives and incentives are being pursued and are described below.

Direct Seed Farming Systems: We heard from several speakers and forum participants that direct seed farming involves using agronomic practices that are generally more sustainable and environmentally-friendly than traditional methods. The system can include a combination of planting and growing crops with much less tilling and soil disturbance, planting crops more often rather than leaving fields fallow for long periods, using a variety of crops and crop rotations, and leaving more residue on the field after harvest. Direct seed has been shown to improve soil and crop health by increasing organic matter, carbon storage, and nutrients. It improves soil structure and water storage and can break down disease and pest patterns. The extra residue protects soil

from the direct action of wind and water --- reducing erosion, windblown dust, and sediment transport into streams. And because crop residue is seen as a valuable resource to direct seed farmers, the need and desire to burn the field after harvest can be reduced.

To further the adoption of direct seed farming, there are numerous research, demonstration, and education projects underway. For example, EPA and the Washington Department of Ecology are collaborating with the Pacific Northwest Direct Seed Association (PNDSA), Washington State University, and the University of Idaho to produce a “*how-to*” video that will be used for grower education. The PNDSA is a tri-state grower-based organization committed to increasing direct seed farming. The project will also enhance the PNDSA website (www.directseed.org) to serve as a clearinghouse of the latest direct seed information.

In May 2001, the EPA, USDA Natural Resources Conservation Service (NRCS), and the PNDSA hosted a regional meeting to bring together parties interested in expanding the adoption of direct seed agriculture through a variety of means, including increased federal funding, collaborative projects, technical assistance, research, and alternative crop markets. The meeting was an excellent first step in bringing all the key players together at one table to discuss options.

Alternatives to Burning for Kentucky Bluegrass: EPA is working closely with the Coeur d’Alene Tribe, the Nez Perce Tribe, and the University of Idaho to study alternatives that would reduce or eliminate the need for burning of Kentucky Bluegrass crops. The \$200,000+ project involves identifying potential alternatives, field testing, evaluating results (including economic and environmental trade-offs), and providing education on the results.

Offsite Straw Utilization: Another way to reduce field burning and smoke emissions is to cut and collect some of the crop residue and haul it away for use offsite. There are several examples across the region where straw is baled and used locally, or sent to other states, Canada, or overseas. Straw has a variety of uses, including animal feed, mulch, ethanol production, and as a source material in the manufacture of bio-based products, such as paper and particle board. The Coeur d’Alene Tribe recently announced that starting next year, all grass and wheat growers on tribal lands will be required to remove up to 90% of their straw before burning. This “bale and burn” method will help to support the Plummer-based Pacific Northwest Fiber plant, which produces panel board.

The State of Washington recently created a *Straw Utilization Task Force* to explore the many options, barriers, and opportunities for use of excess straw. EPA participates on the Task Force and has contributed \$190,000 to a project (*FiberCrops*) which is helping communities to find practical and economic solutions for use of crop residues as a source material for manufacturing paper, building materials, textiles, and other fiber-based products (for more information, see <http://www.fiberfutures.org/straw/>).

Emission Studies: Northwest wheat and grass grower organizations, state agencies, Northwest land grant universities, and EPA have been pooling resources to conduct scientific studies that better quantify and characterize smoke emissions when fields are burned. The data obtained will help answer questions on how much particulate matter is produced using different burning methods and what chemical compounds are in the smoke and in what amounts.

Putting the Pieces Together: Public Health

Concerned individuals and health experts at the forums described how smoke from field burning can create a public nuisance and present a public health hazard. We learned that hundreds of people take the time to file complaints each year about field burning and to question why the practice is allowed. While some are upset with the nuisance odor and haze, most people say that they or a family member experience health problems associated with the smoke. Reported symptoms include trouble with breathing, sore throat, coughing, wheezing, stinging eyes, and headaches. Some say they have to increase their medication use during the burn season or make additional trips to the doctor or hospital. Others say their lives are disrupted physically, emotionally and financially due to increased illness, medical costs, work and school absences, and limits on normal daily activities. Some report feeling trapped in their homes during smoke intrusions or having to leave the area during the day or for an entire burn season. Others say their social events have to be cancelled or that their business is suffering economically.

We also heard from two local physicians who provided firsthand accounts of health impacts in their communities. They see a rise in their patients' respiratory problems, need for medication, and office visits during the burn season. We also learned from scientists who study health effects and air pollution that:

- ▶ Particulate matter (PM) air pollution originates from a variety of sources, including cars, trucks, power plants, industrial processes, fireplaces, backyard burning, agricultural and road dust, and biomass burning (e.g., wildfires, controlled forest burns, and field burning);
- ▶ Particles between 2.5 and 10 micrometers in diameter are called “coarse” particles or PM-10, while particles less than 2.5 micrometers are “fine” particles or PM-2.5;
- ▶ Combustion sources, like field burning, generate a complex mixture of fine PM, gases, and toxic organic compounds;
- ▶ Human and animal studies show that exposure to PM is a health concern;
- ▶ Exposure to fine PM has been correlated with an increase in health problems such as asthma attacks, decreased lung function, cardiovascular changes, more medication use, clinic and emergency department visits, hospitalizations, and premature deaths;
- ▶ Most at risk for illness are people with chronic respiratory diseases (such as asthma, emphysema, and bronchitis), cardiovascular diseases, respiratory infections, the elderly, and children;
- ▶ Even children without any existing illness can be affected because their lungs are still developing and they are generally more susceptible to environmental threats;
- ▶ Many questions remain, however, such as the lower threshold for health effects (how much PM and how long of an exposure does it take?), the exact biological mechanisms

that cause health effects, why there has been an increase in asthma, the role of co-pollutants, the best way to monitor human exposure (central-site vs. personal air quality monitoring), and the validity of epidemiological studies.

We also heard concerns that the National Ambient Air Quality Standards (NAAQS) established for particulate matter by EPA under the federal Clean Air Act may not adequately protect the health of susceptible people during smoke intrusions from field burning. There are several reasons for this concern, including:

- ▶ The only national standard being implemented is for PM-10;
- ▶ The standard is based on 24-Hour and annual average PM levels, not the short-term peak exposures over an hour or two typically seen during smoke intrusions from field burning;
- ▶ It is these short-term “spikes” that may cause the most drastic acute health effects; and
- ▶ Air quality monitors used for measuring air concentrations are not necessarily located in the path of a smoke plume.

The law requires EPA to periodically review and update the NAAQS to ensure that they provide adequate health and environmental protection. EPA updated the PM standards in 1997 to include 24-hour and annual PM-2.5. However, the decision to revise the standards was challenged in court by a number of parties. In a recent decision, the Supreme Court unanimously upheld the constitutionality of the 1970 Clean Air Act provision that authorizes EPA to set national air quality standards at levels necessary to protect public health and welfare (without considering the economic costs of implementing the standards). EPA is now in the process of reevaluating the standards for PM proposed in 1997 and is supporting and compiling research on what kinds and what levels of PM are unhealthy, and over what time periods. Documents related to this review are available at <http://www.epa.gov/ttn/oarpg/ramain.html>.

There are many other efforts underway within the Pacific Northwest to further understanding of air pollution and health effects. A few are described below.

EPA NW Research Center for Particulate matter and Health: Established in 1999 at the University of Washington, the “PM Center” is one of five around the country funded by EPA to study the effects of particulate air pollution on human health. The Center’s multi-disciplinary teams of scientists are looking at the relationships between ambient air quality, population exposures, and individual exposures in order to better understand and prevent PM-associated health effects. Mechanisms of PM toxicity and potential biomarkers are also being studied. Jane Koenig, PhD, the Center’s Program Director, spoke at the forum in Coeur d’Alene. The Center can be found online at <http://depts.washington.edu/pmcenter/>.

Candis Claiborn, PhD, of Washington State University, leads the Center’s research in eastern Washington, and spoke at the Pasco forum. Dr. Claiborn is collaborating with EPA, Eastern Washington University, the Washington Department of Ecology, and the Idaho Department of Environmental Quality on projects to better monitor and model the transport and

dispersion of smoke from field burning. The research team is measuring the particulate concentrations and chemical compositions of smoke sampled downwind of wheat stubble burns.

Fire, Smoke and Health Workshop: On June 5 and 6, 2001, a workshop was held at the University of Washington that focused on the public health implications of adverse air quality resulting from wildfire smoke and related events such as prescribed forest fires and agricultural burning. The workshop brought together scientists and air quality specialists from across the country and the Northwest to identify current research and research needs, to propose health advisory levels for short-term exposures, and to develop outreach and educational materials for health and air pollution agencies to use in the event of smoke emergencies. An excellent collection of smoke and health related guidance documents, policies, technical articles, workgroup products, and outreach materials can be found at the workshop's website at www.firesmokehealth.org.

Idaho Proposes Revisions to Air Pollution Emergency Rule: In November 2000, the Idaho Board of Environmental Quality adopted a temporary rule to add PM-2.5 action-levels and criteria to their Stage 1 Air Pollution Forecast based for both 24-hour and 1-Hour averaging times. After several months of negotiated rulemaking and public participation, the Idaho Department of Environmental Quality is proposing language for a revised temporary rule that is expected to become effective upon the conclusion of the 2002 session of the Idaho Legislature.

Putting the Pieces Together: Government

Representatives from EPA, state, tribal, and/or local agencies participated in moderated panel discussions at each of the forums. Officials were asked to briefly explain their agency's unique role in field burning, and then answer questions from the audience. We learned there are many approaches and authorities being used across the region to manage field burning - from regulatory-based permits to voluntary programs. We heard that an agency's involvement is generally a matter of their statutory and legislative authority, financial resources available to develop and operate programs, and how important the issue is considered.

The wide range of program effectiveness found throughout the Northwest is one reason that EPA Region 10 became more involved in the issue. While there is not a one-size-fits-all approach that can be applied everywhere, EPA is helping individual jurisdictions develop and implement more effective programs through financial and technical assistance, supporting science-based research into alternatives to burning, supporting additional health effect studies, and providing leadership on issues of "regional" concern, such as cross-border movement of smoke and interagency coordination. To guide these efforts, a Regional Strategy was developed, which is summarized below:

LONG-TERM GOALS

- 1) To prevent agricultural burning from endangering public health and safety.
- 2) To minimize or prevent other impacts such as regional haze and nuisance smoke.

OBJECTIVES

- 1) To understand, communicate, and implement our responsibility for field burning in the Northwest (Idaho, Oregon, Washington, and Tribal lands).
- 2) To help find and support non-burning alternatives, economic incentives, and agricultural best management practices to significantly reduce the number of acres burned and smoke emissions.
- 3) To develop a regional approach involving local, state, federal, and tribal jurisdictions that results in more consistent and effective programs to control and reduce field burning and smoke emissions.
- 4) To improve the effectiveness of using National Ambient Air Quality Standards (NAAQS), emergency action-levels, and air quality monitoring networks to protect public health.
- 5) To promote better science-based information and understanding of human exposure and health effects from smoke and its constituents, especially the effects of short-term exposure.
- 6) To determine the status and be able to measure the progress of jurisdictions in managing field burning and reducing impacts.

The full Strategy can be found at the EPA Region 10 website at: <http://www.epa.gov/r10earth/> (then click on the Air button, and then Agricultural Burning). To date, EPA has contributed nearly \$2,000,000 toward projects that support the Strategy (see ix 2).

Efforts by EPA are only a small part of the overall work being done throughout the region on field burning, as individual programs are actually developed, staffed and administered at the state, tribal, and local level. It is not the purpose of this report to outline how each jurisdiction operates, or their effectiveness. Descriptions of individual field burning programs and agency contacts in 21 western and mid-western states and 19 local areas can be found in an *Agricultural Burning Smoke Management Survey* that was prepared for the Western Governors Association. This document is available at <http://www.airsci.com/FEJF/agsurvey.pdf>. Please note that it does not profile tribal programs. Please contact individual tribes or EPA for this information.

The forums highlighted many actions that have been taken within the last year by agencies related to field burning. Some of these and newer examples are described below:

Idaho Enacts Field Burning Rules: Idaho recently enacted temporary rules governing crop residue disposal via field burning. The rules were effective July 1, 2001, and will go before the 2002 Idaho Legislature for review. The new rules require producers who will be burning their fields to register the location of fields and the number of acres to be burned with the Idaho State Department of Agriculture. The rules state that the Director will designate, for a given airshed, burn or no-burn days; the hours that burning will be permitted; and the number of acres to be

burned based on the recommendation of the Idaho Department of Environmental Quality. A copy of the rules is available by calling 208-332-8620, or at the Idaho State Department of Agriculture's website at http://www.agri.state.id.us/Crop/idapa_02.htm.

Clearwater Airshed Pilot Smoke Management Plan: This cooperative project between the Nez Perce Tribe, the Idaho Department of Environmental Quality, and EPA will support the development and implementation of a smoke management plan on the Palouse and Camas Prairies in northern Idaho's Clearwater Airshed. The plan will address reasonable options to reduce smoke and the adverse impacts of smoke generated by field burning during August through October. The project will serve as a model for how smoke from agricultural burning might be successfully controlled in an area of mixed geography, multiple jurisdictions, and shared responsibilities.

Washington Web-Based Burn Permit System: The Department of Ecology is improving their field burning permit program by developing a centralized web-based system to provide staff with more accurate and timely permit data. The system would allow the local permitting authority in each County, and/or growers, to enter, update, and view permit information such as acres and crops to be burned, location of fields, burning justification and alternatives considered, practices to reduce emissions and ensure fire safety, and post-burn reports. When combined with meteorological information, Ecology burn managers will be better able to minimize smoke impacts and notify the public in areas that may be affected. Longer range plans call for the data to be made viewable through a Geographic Information System (GIS) mapping program to further aid in making daily burn call decisions. For more information on Ecology's field burning program, see http://www.ecy.wa.gov/programs/air/agricultural_information.htm.

Field Burning in Oregon: Agency jurisdiction for field burning in Oregon depends on location. On the west side, in the Willamette Valley, the Oregon Department of Agriculture (ODA), Natural Resources Division, Smoke Management Program is responsible for overseeing open field burning, propane flaming, and stack burning of all perennial and annual grass seed residue and cereal grain residue within the Willamette Valley. It is illegal to burn any field residue in the Valley without a permit. In the 1960's, burning exceeded 300,000 acres per year in the Valley, but State action required a phase down in field burning to a present level of about 40,000 acres (not including some other agricultural burning methods such as stack and propane flaming). ODA operates an extensive research program each year for developing alternatives to field burning. For the 1997-99 biennium over \$1,000,000 was budgeted for research and development. Projects included developing alternative crops, alternative field management practices, and straw utilization. Funding comes primarily from fees paid by grass seed growers. For more information, see http://www.oda.state.or.us/Natural_Resources/smoke.htm.

East of the Cascades, the authority for regulating field burning resides mainly with local government. To date, ordinances have been adopted in Jefferson, Umatilla, and Union Counties. The Oregon Department of Environmental Quality assists in reviewing and revising these local programs.

Air Quality Monitoring: Many individuals at the forums said they'd like to see more air quality monitors in their area and have better access to monitoring information. We learned that air

quality monitoring can have many practical uses, such as tracking smoke emissions in real-time during a burn event, informing the public of potential smoke impacts, triggering emergency actions such as burn bans, providing better scientific understanding of actual emissions from field burns, and documenting exceedances of air quality standards.

In the last year, both Idaho and Washington used funding from EPA and their own resources to increase the network of air monitors in areas at risk to impacts from field burning and from other major smoke sources such as wildfires and prescribed forest burning. EPA and the U.S. Forest Service also assisted Union County, Oregon, in locating a new real-time PM-2.5 monitor near LaGrande, Oregon. The Nez Perce Tribe is adding a new monitor on tribal lands as part of the Clearwater Airshed project. Even with widespread support for more monitoring of air quality, progress is limited because the equipment is very expensive to acquire, install, and operate.

Another frequent message heard at the forums was a desire for better public access to air quality information, especially real-time data that could warn of impending smoke intrusions into a community. The availability of this kind of information is still limited, but is increasing as a result of several projects or programs. For example, the Air Quality Index (AQI) is required to be used in large metropolitan areas (more than 350,000 people) for reporting daily air quality in newspapers, radio, television, and the Internet. The AQI indicates how clean or polluted the air is on a given day, along with associated health concerns. Although it is not required, some agencies in the region now report the AQI for many smaller communities as a public health service. To find out if AQI reporting is available for your local area, you can start at EPA's AirNow website (www.epa.gov/airnow) which contains links to many state and local AQI sites. Some states in the region are in the process of upgrading their telemetry equipment and calibrating monitors to increase the number of sites with the capability of reporting air quality in real-time to the public.

Smoke Management: Smoke management is the use of policies and procedures to minimize smoke impacts from burning. The topic was discussed primarily at the Moscow and Pasco forums. A Smoke Management Program (SMP) usually includes the following components:

- 1) Authorization to Burn
 - authorities responsible for implementing the SMP
 - process for granting approval to burn
- 2) Emission Controls and Fire Safety
 - alternatives to burning
 - methods to reduce smoke
 - fire safety procedures
- 3) Program Operation
 - acres, locations, crops, etc. to be burned (emission inventory)
 - smoke-sensitive areas (towns, roads, schools, hospitals, etc.)
 - meteorological data to predict smoke direction, elevation, and dispersion
 - communication of burn decisions

- monitoring of air quality during burns and appropriate actions if problems arise
- collection of post-burn data
- 4) Information and Education
 - public notice prior to burns
 - outreach on purpose of burn and potential impacts
 - actions to avoid health impacts
 - cross-border and interagency coordination
- 5) Oversight and Evaluation
 - compliance/enforcement of SMP
 - assess air quality impacts
 - collect, assess, and respond to complaints
 - revise program as needed

Smoke management is often controversial because it is not a fail-safe way to protect the public from smoke impacts. Programs may be rudimentary or poorly-operated, or there may be unpredicted changes in weather patterns that result in impacts even from the best run programs. Still, smoke management is widely used to minimize the effects of fire emissions on public health and welfare and significant resources are being invested into the development of better technical tools for smoke management.

Burning Information Systems: Northwest agencies and universities are collaborating on a number of projects to improve smoke management operation and public access to information. For example, a project called BlueSky-RAINS is integrating two ongoing technical efforts - EPA's Rapid Access INformation System (RAINS) and the U.S. Forest Service's BlueSky project. RAINS is being developed as a user-friendly system for EPA staff to view, organize, and map a wide array of environmental information from desktop computers. The BlueSky project is combining state-of-the-art information on fire emissions from planned forest and agricultural burning activities with real-time, high-resolution, meteorological model (MM5) predictions and air quality dispersion modeling. The result will be a comprehensive web-based information system related to vegetative burning activities and potential impacts throughout the Pacific Northwest.

BlueSky-RAINS will focus initially on linking to existing information such as fire emission sources, ambient air quality, meteorological data, remote sensing, land use, and agency programs and activities. Later phases will provide more comprehensive capabilities, such as predicting and displaying local, regional, and transboundary movement of smoke plumes and cumulative effects within an airshed from multiple emission sources. Such information should be useful to the burn managers looking for accurate, real-time, predictions of smoke emissions, as well as to the public (such as smoke-sensitive individuals), local agencies, and the media interested in learning about potential fire, smoke, or health impacts for their area. The system is still in the early stages of development, but early phase information should be available within several months.

Visibility and Regional Haze: Particulate matter is a significant source of haze and reduced visibility. In 1999, a national Regional Haze Rule was established by EPA to improve visibility

in national parks and wilderness areas across the country. The rule requires states to develop programs designed to meet long-term goals for protecting visibility. Since regional haze can be caused by many sources located across a broad region often covering several states, regional planning organizations have been formed to help develop the technical and policy tools needed to comply with the regulations. One of these is the Western Regional Air Partnership (WRAP), a collaboration of western tribal governments, state governments and various federal agencies. The activities of the WRAP are conducted by a network of committees and forums. Since burning of all kinds (agricultural, wildfire, prescribed fire, etc.) contributes to regional haze, the Fire Emissions Joint Forum (FEJF) was created. The FEJF is developing a number of policies and technical products related to fire and visibility protection, including products related to smoke management, fire emissions inventory and tracking, alternatives to burning, and public education. For more information, please see <http://www.wrapair.org/index.html>.

Agricultural Air Quality Task Force (AAQTF): The 1996 Farm Bill required the U.S. Department of Agriculture (USDA) to form a task force made up of experts in agricultural production and air quality. In 1999, the AAQTF issued recommendations on agricultural burning to the USDA. Last year, EPA sought public comment on the recommendations to develop EPA policies to address the air quality impacts of agricultural burning. It will likely be several months before the policy is completed. For more information, see <http://www.nhq.nrcs.usda.gov/faca/aaqtf.html>.

Prescribed Forest Burning and the National Fire Plan: An issue that came up at some of the forums was why there was so much attention focused on agricultural field burning when government agencies, especially federal ones, are engaged in prescribed forest burning activities that also produced significant amounts of smoke. In fact, the practice of using fire to manage forest lands is increasing in many areas of the west because of the decades-old policy of suppressing all wildland fires. This has resulted in significant deterioration of forest ecosystem health and dangerous accumulations of fuels which has greatly increased the risk of having larger, more severe, high-intensity wildfires.

To help address the situation, prescribed fire activities are guided by fairly mature and detailed statewide Smoke Management Plans in Idaho, Oregon, and Washington in order to minimize impacts to air quality. And recently, the U.S. Congress appropriated \$2.9 billion for 2001 to help implement a National Fire Plan. The U.S. Forest Service is working collaboratively with EPA and other federal and state agencies to address air quality concerns as the Plan is implemented. Many of the efforts underway will also result in better technical tools and improved coordination of agricultural field burning programs (such as the BlueSky-RAINS project). For more information, see <http://www.fireplan.gov/>.

Conclusions

Field burning is a complex issue without easy solutions or quick fixes. We heard from various stakeholders that no matter what the course, some person or group will be impacted - either economically, socially, or physically. The stakeholder forums provided much valuable

information for both the participants and for those charged with finding workable solutions. Clearly, progress is being made on several fronts, such as:

- ▶ Increased research and demonstration of feasible alternatives to burning, such as direct seed farming systems and straw utilization;
- ▶ Development and implementation of enhanced Smoke Management Programs;
- ▶ Improved science-based studies and public outreach on the health effects of smoke;
- ▶ Additional data being collected to better quantify and characterize field burning emissions;
- ▶ More air quality monitors being installed and increased public access to data;
- ▶ More effective regulatory programs are being developed or improved, such as for web-based permitting, statewide rules, and regional haze; and
- ▶ Increased focus and resources on transboundary and interagency smoke issues.

The efforts described in this report are just some of the many that are underway throughout the region and the country. Some projects will have immediate benefits, while others are more long-term. Some solutions are community-based, while others are regional in scope. EPA will continue to work with our partner agencies to reduce field burning and its impacts by providing regional leadership and assisting those jurisdictions which have the primary responsibility for protecting air quality and public health. However, it is up to all of us who are affected - farmers, scientists, regulators, and concerned citizens - to continue putting the pieces of the puzzle together.

Appendix 1: Summary of Stakeholder Views

This summary of comments, questions, and perspectives on field burning came from the flip charts at the four forums. Some have been edited for readability.

Understanding the Agricultural Perspective — What did we learn?

- ▶ Widespread participation, education, and government interest is needed for solutions.
- ▶ Markets for fiber solutions are needed and this is a limiting factor.
- ▶ More dependable diversity: straw use, crop markets, infrastructures (like oil press).
- ▶ Burning increases grass seed yields significantly.
- ▶ Crop rotation is effective for disease control.
- ▶ Need to invest in straw use alternatives (stubble removal is expensive).
- ▶ Direct Seed works and there are many benefits, like leaving nutrients in the field, but more research needed, especially without burning.
- ▶ Research needed into stubble management, equipment, agronomic practices, economics.
- ▶ There are many alternatives to burning.
- ▶ Varieties and species respond differently to burning or not burning.
- ▶ Fire is a necessary tool, but more research is needed on alternatives to burning.
- ▶ Grass crops reduce soil erosion and protect water quality
- ▶ Develop incentives for environmental practices, e.g., the Harkin Bill Conservation Act.
- ▶ Farming is complex - need a systems approach for solutions.
- ▶ Carbon storage issue is important to environment (less soil disturbance = more carbon).
- ▶ Carbon credits used to offset fossil fuel burning - could be possible international approach to offset cost to farmer of change to direct seeding.
- ▶ EPA should get a direct seed proposal to USDA's Agricultural Air Quality Task Force.

What More Do We Need to Know about Agricultural Aspects?

- ▶ Research on burning alternatives, rotation of crops, alternative crops, and burn methods to reduce smoke.
- ▶ Alternative uses for residue.
- ▶ Impacts of residue removal to soil tilth and organic matter.
- ▶ How can we decrease burning and keep farmers alive and profitable?
- ▶ Economic impacts of burning or not burning.
- ▶ Need more agronomic research, sustainable farming practices.
- ▶ Equipment needs and costs for converting to direct seed.
- ▶ Alternative residue uses: cost, environmental impacts, and research.
- ▶ Is there a difference in quantity of smoke depending on type of crop?
- ▶ Is there a difference in compounds emitted by crop type?
- ▶ Which meteorological conditions are best for burning?
- ▶ What can be done to make alternatives to burning economically viable?

- ▶ How do we get started in learning and asking hard questions to motivate change?
- ▶ What can be done by state and federal governments to improve markets for fiber?
- ▶ Carbon-stored in soil tillage breaks down organic matter.
- ▶ Goal is to improve plants to store carbon.
- ▶ Farm Program incentives should look at a systems approach.
- ▶ Burn distribution: when, where, how much?

Understanding the Health Perspective — What did we learn?

- ▶ People with lung and other diseases are vulnerable to smoke.
- ▶ Emergency room visits increase during burning.
- ▶ Increasing population means more people exposed.
- ▶ Pollution from different sources contains different chemicals that affect health differently.
- ▶ Smoke content analysis is being done.
- ▶ Smoke from vegetative burning is mostly PM-2.5.
- ▶ PM-10 may be annoying but PM-2.5 is dangerous.
- ▶ PM-2.5 particles migrate indoors and may equal ambient levels outdoors.
- ▶ PM-2.5 is definitely detrimental to public health as the particle's lodge deep in the lungs.
- ▶ EPA should re-look at air quality standard for short-term PM exposure.
- ▶ Insufficient data so far to establish a short-term standard for PM-2.5.
- ▶ There are not enough continuous monitors distributed around the Pacific Northwest.
- ▶ There are new monitoring stations in Idaho and Washington.
- ▶ There are a lot of gray areas, unknown effects, and studies are inconclusive and confusing.
- ▶ There is controversy over the validity of many PM health studies.
- ▶ Relative risk is difficult to understand.
- ▶ Need to research the cumulative sources of air pollution.

What More Do We Need to Know about the Health Aspects?

- ▶ What level of burning is acceptable?
- ▶ Total cost of burning to society.
- ▶ Correlation between field burning and air quality.
- ▶ Percent of PM-2.5 from field burning.
- ▶ Chemical components of wheat and grass smoke.
- ▶ Data on agricultural chemicals and residue from burning.
- ▶ Reports from complaint hotlines.
- ▶ Barriers to improved continuous monitoring networks with alert systems.
- ▶ Correlation of local forecasting to making burn decisions.
- ▶ How to manage airsheds.
- ▶ Threshold for human health impacts from PM.
- ▶ Resolve confounding effects of other pollutants (e.g., ozone).
- ▶ Underlying cause of asthma. Why is there an increase?
- ▶ EPA needs to look at other sources of burning and their effects.

- ▶ More coordination between EPA and agencies that manage forest burning.

Understanding Mandates and Constraints of the Agencies

- Key points from the Regulatory Panels

- ▶ Citizens do make a difference.
- ▶ Need continued involvement of all affected parties.
- ▶ Idaho is adopting short-term PM action-levels and statewide field burning rules
- ▶ Idaho currently has the densest locations of monitors in the Northwest.
- ▶ Coeur d'Alene Tribe seeks partnerships with the community, EPA and Idaho.
- ▶ Many state air regulations are enforceable by EPA.
- ▶ EPA can use Section 303 of the Clean Air Act to prevent health endangerment.
- ▶ New regulations are not the preferred or intended approach by EPA.
- ▶ Locally-based solutions are the key, that's what will work over the long term.
- ▶ Airsheds don't recognize political boundaries.
- ▶ Agencies are working for solutions on a regional level, across state and tribal borders.
- ▶ Look at smoke in total - all sources.
- ▶ Need to share data and work together (local, state, federal, tribal).

Where do we go from here? Ideas for workable solutions.

- ▶ Keep all of the stakeholders involved in solving problems.
- ▶ Continue collaborative problem solving with producers, researchers, agencies and public.
- ▶ Keep attention on regional issues, but remember that solutions are found and felt locally.
- ▶ Be consistent across the region from a regulatory standpoint.
- ▶ Create an early-warning system for smoke so people know about potential impacts.
- ▶ Put smoke reports on TV and radio, like weather forecasts.
- ▶ Increase resources for monitoring, weather forecasting, and reviewing data.
- ▶ Better understand agriculture's contribution to air quality problems.
- ▶ Have better permit programs.
- ▶ Establish schedules so all growers don't burn at the same time.
- ▶ Clarify and establish criteria for essential burning.
- ▶ Do more research on the health issues.
- ▶ Change federal incentives for crop selection.
- ▶ Reward "good" and penalize "bad" farming practices.
- ▶ Provide incentives to growers to change their practices.
- ▶ Invest in a major commitment to agricultural research.
- ▶ More research into alternatives and implementation of Best Management Practices.
- ▶ More research of farm problems that lead to burning (crop diseases and pests).
- ▶ More research on harvesting Kentucky Bluegrass in alternate years without burning.
- ▶ Increase financial/tax incentives to reduce burning.
- ▶ Support straw utilization efforts, such fiberboard plants.
- ▶ Reduce smoke emissions by baling in areas where feasible.
- ▶ Set goals for reductions in burning and measure progress.
- ▶ Educate growers and public on ways to minimize smoke impacts.
- ▶ Promote burning as a last alternative – not the first.

Appendix 2

EPA Funding to Support Regional Agricultural Burning Strategy			
Project Description	Amount	Recipients, Contacts and Collaborators	Start Date
Mediation services for field burning lawsuit in Washington State	\$50,000	National Center Associates, Inc.	March 2000 (Completed)
Internet-Based Permit System for Agricultural Field Burning	\$60,000	Washington Department of Ecology Karen Wood, kwoo461@ecy.wa.gov	July 2000
Cereal-Grain Crop Open-Field Burning Emissions Study	\$45,134	Washington Department of Ecology Karen Wood, kwoo461@ecy.wa.gov	July 2000
Fiber Crop Solutions: assist communities in the Columbia Basin with feasible alternatives to burning through utilization of agricultural residues	\$190,000	Fiber Futures Jeanne Trombly, jeanne@fiberfutures.org	August 2000
Idaho PM-2.5 Monitoring: new sites to monitor fine particulates, including smoke impacts from agricultural and silvicultural burning and wildfires	\$225,000	Idaho Department of Env. Quality, Matthew Stoll, mstoll@deq.state.id.us	August 2000
No-Till Sowing into Irrigated Wheat Stubble Instead of Burning: agricultural research and demonstration project	\$37,500	Washington State University Cooperative Extension, Lind Experiment Station, Bill Schillinger, PhD, schillw@wsu.edu,	October 2000
Agricultural Field Burning Smoke Emissions: Concentration Measurements	\$17,019	Washington State University Candis Claiborn, PhD, claiborn@wsu.edu	November 2000 (Completed)
Facilitation services for Stakeholder Forums	\$16,185	NW Dynamics, LLC	December 2000 (Completed)
Assessment of Agricultural Burning by Real-Time Monitoring of PM-2.5 in Lewiston, Idaho	\$40,000	Idaho Department of Env. Quality, Ray Roetman, rroetman@deq.state.id.us	December 2000

EPA Funding to Support Regional Agricultural Burning Strategy			
Eastern Washington Agricultural Burning PM-2.5 Characterization Study: install and operate additional air quality monitoring sites	\$202,030	Washington Department of Ecology Mike Regan, mrag461@ecy.wa.gov	January 2001
Independent Evaluation of Agricultural Burning: characterize air quality impacts in eastern Washington and northern Idaho from field burning	\$54,688	Washington Department of Ecology Karen Wood, kwoo461@ecy.wa.gov Washington State University Candis Claiborn, PhD, claiborn@wsu.edu	March 2001
Study of Hydrocarbons, Irritating and Toxic Phenols, and other Biological Toxins in Smoke from Burning Wheat Stubble	\$72,226	Eastern Washington University Jeff Corkill, PhD, jcorkill@ewu.edu Washington State University Candis Claiborn, PhD, claiborn@wsu.edu	March 2001
Support to Fire, Smoke and Health Workshop: conducted June 2001	\$50,000	University of Washington David Kalman, PhD, dkalman@u.washington.edu	March 2001
Orchard Chipping Project: feasible alternative to burning of orchard tear-out and prunings	\$130,000	Washington Department of Ecology Susan Billings, sbil461@ecy.wa.gov	May 2001
Extension of MM5 12 Kilometer Domain to Cover Entire State of Idaho: enhances meteorological model and data for Idaho	\$100,00	Idaho Department of Env. Quality, Diane Riley, driley@deq.state.id.us University of Washington	May 2001
Clearwater Airshed Pilot Smoke Management Plan: state portion	\$90,241	Idaho Department of Env. Quality, Robert Wilcosz, rwilcosz@deq.state.id.us	July 2001
Clearwater Airshed Pilot Smoke Management Plan: tribal portion	\$123,051	Nez Perce Tribe Julie Simpson, julies@nezperce.org	September 2001
Smoke Management Improvements for Union County: support for air quality monitoring of PM-2.5 near LaGrande, Oregon	\$6,200	Union County Soil and Water Conservation District, Union County, U.S. Forest Service	July 2001
GIS Mapping of Washington's Agricultural Burn Permitting Data Base	\$60,000	Washington Department of Ecology Karen Wood, kwoo461@ecy.wa.gov	July 2001

EPA Funding to Support Regional Agricultural Burning Strategy			
Development of Agricultural Burning Best Management Practices Manual	\$60,000	Washington Department of Ecology Karen Wood, kwoo461@ecy.wa.gov	July 2001
Study to Investigate Possible Alternatives to Reduce or Eliminate the Need for Agricultural Field Burning of Kentucky Bluegrass	\$125,153	Coeur d'Alene Tribe anomee@veriomail.com Nez Perce Tribe University of Idaho	August 2001
Reducing the Need to Burn Cereal-Crop Straw Residue through Adoption of Direct Seed/No-Till: a) Further develop www.directseed.org b) Produce direct seed "how-to" video	\$23,066	Washington Department of Ecology Melissa McEachron, mmce461@ecy.wa.gov Whitman County Conservation District PNW Direct Seed Association Washington State University	Pending
Quantifying Post-Harvest Emissions from Grass Field Burning	\$12,500	Idaho Department of Env. Quality, Dan Redline, dredline@deq.state.id.us Washington State University Bill Johnston, PhD, wjohnston@wsu.edu	Pending
Pacific Northwest Burning Information System: BlueSky-RAINS project	\$60,000	Idaho Department of Env. Quality, Robert Wilcosz, rwilkosz@deq.state.id.us	Pending
BlueSky-RAINS (funding from EPA Headquarters)	\$150,000	U.S. EPA Region 10 schweiss.jon@epa.gov U.S. Forest Service , PNW Research Stn Sue Ferguson, sferguson@fs.fed.us	Pending

Note - This table includes only EPA funding contributions to projects - some are fully-funded by EPA while other projects have received other funding or in-kind services from various other sources.